

DOCUMENT RESUME

ED 340 343

IR 015 321

TITLE Impact Assessment and Forecasts of Information and Telecommunications Technologies Applied to Education and Training: Volume III--Annex & Glossary. Analysis of Key Issues for the Orientation of the Work of Sector Actors in the Framework of DELTA.

INSTITUTION Commission of the European Communities, Brussels (Belgium).

REPORT NO XIII/F/DE1715C

PUB DATE May 90

NOTE 44p.; Cover title is: "Impact Assessment & Forecasts of Information and Communications Technologies Applied to Flexible and Distance Learning." For related reports, see IR 015 316-323.

PUB TYPE Information Analyses (070) -- Reference Materials - Vocabularies/Classifications/Dictionary (134) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC02 Plus Postage.

DESCRIPTORS *Computer Networks; *Distance Education; Foreign Countries; Global Approach; Higher Education; *Information Technology; Labor Force Development; Open Universities; Postsecondary Education; *Technological Advancement; Telecommunications

IDENTIFIERS Electronic Universities; European Communities Commission

ABSTRACT

This annex to the main report, the third volume in a three volume set, is based on a study performed by the DELTA (Developing European Learning through Technological Advance) unit in parallel with the projects underway in the research and development Exploratory Action. It provides an assessment of the world situation in flexible and distance learning, including the European Community, North America, Latin America, Africa, Asia, and Australia. Cross-national, national, and regional initiatives on open and distance learning are described, and issues in education, training, telecommunications, and information technology are discussed. The glossary of terms which concludes the report includes acronyms.

(DB)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

ED340343

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

- ☐ This document has been reproduced as received from the person or organization originating it.
- ☐ Minor changes have been made to improve reproduction quality.
- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Ref:XIII/F/DE1715C
May 22, 1990

IMPACT ASSESSMENT & FORECASTS
OF INFORMATION AND COMMUNICATIONS TECHNOLOGIES
APPLIED TO FLEXIBLE AND DISTANCE LEARNING

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

Roland Huber

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

- VOLUME III: ANNEX & GLOSSARY -

Analysis of key issues for the orientation of the work of sector actors in the framework of
DELTA

12015324

**IMPACT ASSESSMENT AND FORECASTS OF INFORMATION AND
TELECOMMUNICATIONS TECHNOLOGIES APPLIED TO EDUCATION AND
TRAINING**

VOLUME III - ANNEX & GLOSSARY

*Analysis of the key issues for the orientation of the work of sector actors in the framework
of DELTA.*

*This report is the summary of the results of a study performed by the DELTA unit
(Directorate XIII-F) in parallel with the projects underway in the R&D Exploratory
Action.*

CONTENTS OF VOLUME III

Preface	ii
Annex: Overview of Flexible & Distance Learning	1
Glossary of Terms	33
Full Table of Contents	42

PREFACE

This volume of the Impact Assessment and Forecasts Report on Information and Telecommunications Technology Applied to Education and Training forms part of the review process within the DELTA framework, carried out in order to assess the achievements of the programme in a broader context and to point the way forward to the future developments needed in the domain of Advanced Learning Technology at a European level. It identifies the key issues, associated requirements and options and potential actions to be taken. Thus it aims at orientating the work of the sector actors in the framework of DELTA.

The other volumes of the report are:

- Volume I: Executive Summary.
- Volume II: Main Report and Issues Analyses.

ANNEX - OVERVIEW OF FLEXIBLE AND DISTANT LEARNING

1. INTRODUCTION

The International Council for Distance Education has estimated that there are currently around 10 million students taking degree courses at a distance in the world. No organization has attempted to estimate the number of people using distance education¹ methods for other areas and levels of study (such as continuing education, technical education, vocational and professional training), but it must be comparable if not greater. In the USSR alone, where there are about 1,200 distance-teaching institutions, some 1.5 million students take higher education courses at a distance; this figure represents about 30 per cent of all students in institutions of higher learning (Ilyin, 1983)². In China, in 1983, about 40 per cent of the country's university population (around 1 million) were taking courses at a distance - a third of these under the supervision of the Radio and Television University of China (RTVU), the remainder with local television universities and university correspondence programmes (Yu Xu, 1986)³. In the last fifteen years, new institutions or organizations catering exclusively for distance learners have been established all over the world like in Thailand, Indonesia, Japan, India, Pakistan, Taiwan, Hong Kong, Sri Lanka, Canada, the United States, and several other countries. A number of overviews on distance education have been published during the last few years.⁴

In Europe, 22% of the population are in some form of full time education at any one time, and more than 10 million undergo some form of training or re-training every year. This amounts to 85 million people in education or training each year. This accounts for just under 1/3rd of the EC population. The training and retraining need is a growing problem, with Community undertakings looking for higher skilled workforces, and needing to adopt massive training and re-training programmes to maintain step with technological change.

Europe remains, at present ahead of both the USA and Japan in terms of pedagogy, training methodologies and the development of comprehensive training and education provision. It can also offer these benefits to the Third World on a more cost effective and easily implemented basis as a consequence of its earlier history.

This paper attempts to assess, in May 1990, the world situation in Open and Distance Education and Training. A large quantity of information gathered during a study tour to the

¹Education, where not specifically referenced, is used to cover the expression "Education, Training and Retraining" in the context of this paper.

²Ilyin V (1983) The U.S.S.R. Financial and Economic Institute For Distance Education, Distance Education, vol 4 no 2, pp.142-148.

³Yu Xu (1986) A Look into some aspects into Distance Education in the People's Republic of China, Distance Education vol 7, no 1, pp.92-105.

⁴Chang T., Crombag H., Van Der Drift K. & Moonen J. (1983), Distance Learning: on the Design of an Open University. Boston/Den Haag/London, Kluwer-Nijhoff.

Daniel J., Stroud M. & Thompson J. (1982), Learning at a Distance: a World Perspective, Edmonton, Athabasca University/Conseil International de l'enseignement par correspondance.

Henri F., Kaye A. (1985), Le Savoir & Domicile: Pedagogie et Problématique de la Formation à Distance, Québec, Les Presses de l'Université du Québec.

Rumble G. & Harry K. (1982), The Distance Teaching Universities, London, Croom Helm.

Harry K. & Raggatt P. (1984), Trends in Distance Higher education, Milton Keynes, Open University Distance Education research group.

Kaye A. (1988), Distance Education: The State of the art, Prospects, vol 18, no 1, pp 43-54.

USA, Canada, Australia, Hong Kong and Bangkok by DELTA actors is included (Foley, Schwartz, Van Heddegem, Van Langenhove, Wallsgrove, Dec. 1989)⁵. The training and retraining situation in Western Europe has addressed in a general way looking into some CEC and international initiatives. A state of the art of national and regional initiatives in the domain of flexible and distance learning in the CEC is also included.

2. FLEXIBLE AND DISTANCE LEARNING IN THE EUROPEAN COMMUNITY

Governments in Europe have a long tradition of involvement in distance education networks, initially as a means for reaching geographically isolated groups (Eg. colonial administrators, inhabitants of geographically remote regions). It is said that the history of distance education goes back to the correspondence courses in shorthand organised by Isaac Pitman when the first regular postal services were established in Great Britain in 1840. The first real correspondence-course institution was the Toussaint and Langenscheidt Institute, founded in Berlin in 1856 to teach languages (Dieuzeide, 1985)⁶. From then on there was a steady growth in the development of correspondence-course provision - often associated with occasional face-to-face teaching sessions - in a wide range of countries, both in the public and private sector. However, until relatively recently, such provision had often been a second-best alternative to conventional education.

In the last fifteen years or so, however, a number of factors have contributed to a *major change in the status of distance education* as an appropriate and effective mechanism for the education and training of adults (OECD, 1988⁷; European Round Table, 1989⁸). Economic changes have radically altered the skills required by enterprises. This has meant rethinking the objectives of, in particular, the initial education system. The pace of economic change has also led to an increased demand for continuing education provision. The large number of people made redundant from declining traditional industries has also produced a need to retrain the unemployed.

Significant changes in demographic profiles that are underway or predicted have also prompted a renewed concern to ensure there will be a sufficient supply of necessary key skills for future economic demands. Advances in new educational technologies have further stimulated the interest in distance learning for man education, as an integral part of existing educational structures.

Education as a science has lagged behind in the exploitation of the newer technologies. The penetration into a developing European market can not only serve to enhance European industry's competitive edge but can also satisfy increasing demands for more individualized, tailored learning through open and distance methodologies. These permit learning to take place more at the choice of the individual or organization in a freer and more effectively structured environment which complements and extends existing provision at the same time as learning motivation and outcomes are greatly increased. For an overview of the relevance of IT&T technologies to distance education, see references below.⁹

⁵Foley M., Schwarz U., Van Heddegem J., Van Langenhove L., Wallsgrove R. (1989), Study Tour on Flexible and Distance Learning by DELTA actors, internal document.

⁶Dieuzeide H. (1985), Les Enjeux Politiques, In: Henri F. & Kaye A., Le Savoir à Domicile: Pédagogie et Problématique de la Formation à la Distance.

⁷OECD (1988), New Technologies in the 1990s: A Socio-Economic Strategy, Nouvelles technologies: Une Stratégie Socio-économique pour les Années 90, Paris, OECD, 127p.

⁸European Round Table (1989), Education and European Competence: ERT Study on Education and Training in Europe, 38p.

⁹Bates A., (1984), the role of Technology in Distance Education, London, Croom Helm.

Bates A (1989), Technology for Distance Education: A 10 Year Prospective, in Trindade: Report on Long-term Developments for European Distance Education, European Association of Distance teaching Universities, Lisbonne.

The concept of open and distance learning has unfortunately not the same meaning everywhere, as there is such a diversity between the various distance-education models adopted in different countries.

The European environment for open and distance learning was recently fragmented and disorganised at national and regional levels, coupled tightly to traditional educational systems but a variety of actions are seeking to change this. At present several European initiatives, promoting the use of open learning in a variety of ways, can be identified. Some are specifically targeted at distance education; others encourage the use of distance education within a wider framework of educational action. Some are initiated by the European Commission; others are more private initiatives on an international level. A huge amount of activity is also visible on the national, and even regional, level.

2.1. EUROPEAN COMMISSION PROGRAMMES ON OPEN AND DISTANCE LEARNING

The use of open and distance learning is of particular interest to the European Commission for three main reasons (Council of Ministers, Fox (1989))¹⁰: (i) the provision of cost effective education and training to meet the economic and social needs of the Community; (ii) the enhanced accessibility of educational opportunities for individuals and SME's that open and distance learning offers and last but not least (iii) the particular effectiveness of open learning for the rapid transfer of technology skills between regions.

Major programmes of the European Commission which address this area are :

- DELTA
- COMETT
- ERASMUS

DELTA aims to provide the hardware, software and communications technologies to support advanced methods of open and distance learning. DELTA is an acronym for "Developing European Learning through Technological Advance". DELTA is funding transnational European Research and Development projects that aim to develop advanced learning technologies for open and distance learning on a European scale. These projects are involved in incremental R&D, based on state-of-the-art and future information technology and telecommunications. The Commission has finalised contract negotiations for 30 R&D projects launched under the DELTA Exploratory phase. The DELTA exploratory Action is based on a 2 years duration and a Community contribution of 20 MECU¹¹. Those DELTA projects will support research and development required to enable emerging IT&T technologies to be used for learning. The devices and techniques to be addressed include: more powerful processors, better software tools for authoring, artificial intelligence expert systems and direct broadcasting by satellite. Other key projects involve building on major emerging ESPRIT results, mainly for cognitive user modelling and for the Portable Educational Tool Environment.

Bacaich P., Kaye A. & Lefrère P. (1986), *New Information Technologies for Education and Training*, Oxford Surveys in Information technology, vol 3, pp. 271-318.

OECD (1988), *ibid.*

Ruggles R. et al (1982), *Learning at a Distance and the New Technology*, Vancouver, Educational Research Institute of British Columbia.

¹⁰Fox M. (1989), *Key issues in Distance Education, a Government Viewpoint*, European Journal of Education, pp. 31-45.

¹¹OJL 206/27 30.07.89

According to the Mid-Term Review carried out to assess the initial objectives of the DELTA programme, the DELTA Exploratory Action has made a very positive start to collaboration and progress in this domain. It will meet its objectives. DELTA has created an unusual amount of interest in the user community. Since the initial work started, a European Learning Technology Association¹² has been established, to bridge the inter-disciplinary gaps between appliers of DELTA developments (eg production centres or authors) and ITT&B technologists. The major axis of the DELTA exploratory workplan has been well supported. The prototype Portable Educational Tool Environment (PETE) is well underway; work on Human factors, Authoring Systems and their context in the organizational model of where learning is to take place, are also strong points.

COMETT¹³ is producing a European library of multimedia courseware, and is both training trainers and educators in learning technologies and targeting industry by establishing University Enterprise Training Partnerships (UETP). COMETT I was a 45 million ECU programme to encourage education and industry to cooperate in producing continuing education on national and European level. COMETT II¹⁴ started in 1990 with 200 million ECU approved.

ERASMUS, an 85 million ECU programme, provides support for distance education by assisting the creation of a European Open University through the European Association of Distance Teaching Universities (EADTU). It establishes inter-university networks and encourages mobility of students between member countries.

The Commission has also funded CEDEFOP for valuable studies in the use of distance education and its management. EUROTECNET is a network of demonstration projects to improve training and retraining in information technology in the member states for specific target groups such as unskilled young people, women, skilled workers and obsolescent industries, etc. The Regional, Social and Structural funds of the Community have also a strong interest in European education and training. They have funded some initiatives in areas related to the new information technologies.

Other but broader oriented education programmes initiated by the Commission are Young Workers Exchange Scheme (a sister programme of ERASMUS but to encourage companies to exchange young people), LINGUA, a new programme to encourage the development of foreign language skills both in industry and in the educational system and TEMPUS (establishing a Trans-European Mobility scheme for university studies to enable Central and Eastern Countries to participate in education and training programmes).

2.2. CROSS-NATIONAL INITIATIVES ON OPEN AND DISTANCE LEARNING

Besides specific actions undertaken by the European Commission several initiatives on open and distance education, training and retraining on a European level can be identified. All these initiatives show how essential the role of both industry and education is in making government funding work for Europe. These projects could not have worked without enthusiastic cross-industry and cross-border cooperation.

¹² ELTA - Launching the European Learning Technology Association, ECC Ltd, Enschede, Holland, April 1989

¹³ Council Decision 86/365/EEC OJL 222. 8.8.86 p17

¹⁴ Council Decision OJL 13. 17.1.89 p28

EADTU: One of the most important initiatives on Open and Distance Education is the creation of the body European Association of Distance Teaching Universities (EADTU), including the main distance teaching higher education institutions responsible for over 325,000 students (Trindade, 1988)¹⁵.

An educational satellite service (EuroPACE) is a joint project between 12 European IT-related industrial companies (British Telecom (UK), Thomson (F), IBM (Europe), Philips (NL), Fundesco (E), Hewlett-Packard (Europe), Fundetec (P), DEUS (D), Bull (F), NORIT (Scandinavian), IRI (I) and DEC (Europe) to provide advanced level continuing education by satellite from expertise centres in European universities to industry (Bieber, 1989)¹⁶. It also has the support of the SEFI, the Standing Commission of University rectors and Vice-chancellors (CRE) and the European Cultural Foundation. From being just an idea in 1987, it now broadcasts courses in 6 high-technology areas across Europe and also includes delayed and real-time interactivity. It is mainly designed for transmission of advanced training courses from universities to industry across the EEC and the Nordic countries.

The EUROSTEP project is an educational broadcasting channel using the European satellite Olympus, launched in July 1989. The objectives of this project are to develop and prove, in orbit, key satellite technologies which will be relevant to commercial satellite programmes in the 1990's and to demonstrate new applications of satellites for communications and broadcasting. One of these applications is education and training: on the high power European direct broadcast beam there are nine hours per day of education and training programmes, originated by 300 organisations from 16 countries in Europe.

There are many other programmes which link education and training actors (students, teachers and instructional designers for example) through existing electronic mail networks. One of these is the PLUTO project run by the Centre for Information Technology in Education at Manchester Polytechnic, UK (Longworth & Rhys, 1989)¹⁷. It is one of the few with an international connectivity. It promotes international collaborative learning in the context of European teacher training. PLUTO aims to link teacher training institutions in several countries for joint development work in information technology, communications and languages. It is expected to expand into an open-access, self-funding network incorporating most European Teacher Training Institutions by 1992.

Another, more informal initiative called the European Schools Project links secondary school pupils in the UK, the Netherlands and the Federal Republic of Germany so that they can discuss, via electronic mail, the work they are doing for specific geography & environment related projects. A requirement for multinational input to their work is regarded as essential. Plans exist for the extension of the project to other countries.

Video broadcasting, "Universities of the Air" and "teleteaching" programmes are already in existence.

¹⁵Trindade A. (1988), report on Long-term Developments for European Distance Education, EADTU Lisbon, p.131.

¹⁶Bieber J. (1989), Setting-up a Pan European Satellite Delivery System for Distance Education.

¹⁷Longworth M. & Rhys G. (1989), The PLUTO International Networking Project, in Key Issues in Distance Education, European Journal of Education, pp. 88-95.

2.3. NATIONAL INITIATIVES IN THE EUROPEAN COMMUNITY

Member States of the Community also pursue their own initiatives on open and distance education.

2.3.1. Education

The creation of the UK Open University (UKOU) attracted world-wide attention and its success has been extensively reported. It now enrolls some 80,000 students using a rich multimedia system which includes the use of television broadcasts, correspondence texts, videos and audio cassettes as well as face to face tuition.

Tutoring and counselling facilities are available for students at 250 study centres throughout the country. The centres offer opportunities for students to meet regularly with tutors, counsellors and fellow students and also to make use of computer terminals. Telephone tutorials are sometimes used on smaller population courses where face-to-face is uneconomic. Computer technology is used extensively in university administration and in the continuous assessment process. A great number of courses in all faculties have a component requiring students to make use of a terminal or a microcomputer. The recent OU home computing initiative has enabled students to communicate with tutors and with other students through microcomputers in their own homes linked to a University mainframe computer.

At the moment, the British Open University is also using electronic communications as an additional service for students. Videodisc technology is used for teaching purposes on a small scale, and CD-ROM is being used to carry databases.

In the UK, the Open Tech and Open College programmes show the transition from a supply-driven model for distance education to one which is demand-led. In France, the government has recognized the importance of multimedia training materials and methods by the establishment of a foundation to encourage their production and distribution. The Open University of the Netherlands is exploiting various forms of industry-linked open and distance learning, as is Fern Universiteit in Germany. The Universidad Nacional de Educacion a Distancia in Spain is experimenting a pilot using videotex in 50 associated centres and videoconferencing experiments as a communication link with students.

Most of the European countries developed a positive policy towards the use of information technology and telecommunications on the domain of education. For example in Spain and Portugal national programmes as MINERVA, ATENEA and MERCURIO create a huge impact on the use of new technologies in the educational domain and an increase of company involvement. In particular, the setting up of a regional human and technical infrastructure makes for easier information dissemination and the possibility of communication between different regions.

2.3.2. Training

Open and Distance education is one response to three issues which are particularly relevant to in-company training:

- (i) the growing awareness of the crucial importance of properly qualified and updated technical support staff in all sectors of the economy;
- (ii) the need to widen the opportunities for training and retraining available for adults generally
- (iii) the need to exploit more fully both the vocational training resources of the country and the application of new technologies and modern approaches to training.

In contrast with the United States, co-operation between industry and educational institutions has traditionally been relatively weak in Europe. This is especially true for academic studies and research. For example, expenditure on training per employee is \$1,500 in the United States, while it is only \$200 in the United Kingdom. In West Germany, it is estimated that more than one million adult employees receive continuing education each year, half of which is provided by companies. In Japan, about 80 per cent of all firms implement some form of training and one third of all workers participate in formal courses (OECD, 1988,7)¹⁸.

However, a survey executed by the European Round Table (1989)¹⁹ revealed that most companies are increasing their investments in education and the use of IT in training.

Whilst the smaller company in Europe spends little in vocational education and training, it is not uncommon among the very large companies to find that well in excess of 10% is spent for a closer look at new forms of education and training and, in many cases, investment in the development of open and distance learning. The need to give access to cost effective training aids to smaller firms is however apparent.

To illustrate this we can take the example of France. The following table, taken from "Legislation Sociale" of December 10th 1987, shows that the *biggest effort in adult training is being made in the large company sector.*

No. of employees:	1981	1982	1983	1984	1985	1986
10 to 19	0.98	1.00	1.10	1.16	1.14	1.14
more than 2,000	2.91	3.06	3.36	3.45	3.62	3.82
Total of all cos	1.88	1.97	2.14	2.17	2.24	2.34

Table 1 the Percentages of salary mass given over to the training of personnel in small and large companies (source: Liaisons Sociales no 10110. December 1987).

The small company is faced with two major constraints in the search for satisfactory staff training. The first is that of freeing staff for training and the other is the investment. Hence in France, too, some form of distance learning may be the only way to offer training to members of small companies and this could provide a cost-effective means of meeting legal requirements. Nevertheless, the small company is perhaps the least aware of the concept of open learning.

Only very recently have efforts been made to overcome the training dilemma of the small firm. Working groups are due to be set up over the coming months to look into how other European countries are dealing with the problem of training the small manager. For example, the EuroPACE programme is attempting to address this problem through the use of satellite technology.

¹⁸Ibid.

¹⁹Ibid.

To illustrate the state of the art of flexible and distance training some national initiatives are described in more detail. The choice of these initiatives among the larger range of interesting and challenging developments, research and activities is purely arbitrary. A more detailed and complete overview of most of the initiatives is in preparation. Following examples must therefore only be regarded as illustrations of flexible or distance training in industry.

To illustrate *satellite training* we refer to the situation in France and Italy as examples. A well known example in the domain of satellite education and training is the corporate programme EUROPACE. Apart from some adjustments on technological points (eg the ability to facture uses of images) the biggest obstacles to confront are clearly human and cultural factors. For specialised topics the satellites are already used in a commercial environment as for example MVS. France has a leading experience in satellite training with overseas Guadeloupe, Martinique and Reunion. The economics of communications and training are quite different. For instance the BRED bank recently acquired a subsidiary in Guadeloupe and had to train the staff. For economic reasons it chose to install studios to undertake videoconferencing between the two plants rather than sending hundreds of people across the Atlantic.²⁰

For *terrestrial networks applications* initiatives like MINITEL are evident, and it is one of the world's largest networks with more than 4 millions terminals. However the screen has only 40x24 characters, is alphabetic and semigraphic and is only adapted for inscriptions, tests, for the follow-up of learning but not for proper courseware. Nevertheless it is very often used as a mean for electronic mail with a necessary but distant tutor or teacher.

In addition, a number of major Italian companies have experimented with the use of open learning for the training of staff, eg. Fiat, Alitalia and SIP. For example SIP has planned with SEVA and SYSMEDA a Distance Learning System, called FORTEL, for the training of internal personnel. The aim of the project is to place the computer at the side of the teacher in his work, both as a tool and as a means of communication, and to introduce its use in learning by the students. The service connects several participants in the teaching system: the "internal" bodies responsible for supervising the system, among which we have administrative functions and system management functions, and the "external" bodies, which include the central director of education, the local course director, the tutor and the students. The experimental phase includes verification both of specific coordination functions of the education director in Rome and Milan head offices and all the regional SIP offices, and actual teaching activity, to be carried out in Sicily, using machines for approximately 200 workstations.

Computer based training is used in a variety of industrial and commercial settings all over Europe. To illustrate this we refer to the UK situation. Computer based training is largely used in the UK. (McKeown & Gardner, 1989)²¹ and the Manpower Services Commission (1982)²² have found that CBT has been making in-roads into the training provision of the military services and the manufacturing, design and service industries. It is not simply used for basic and procedural skills training but also for the less clearly defined skills of management.

²⁰In Apprendre, the magazine of CNED, July 1989)

²¹McKeown A. & Gardner J. (1989), Computer Based training in the United Kingdom, Proceedings of the Sixth International Conference on Education and Training, vol 1, pp. 234-237.

²²Manpower Services Commission (1982), Final Report on the Computer Based Training Development Programme, Mills and Allen Communications Ltd, UK.

The growth of CBT is illustrated by the Manpower Services Commission report (1983)²³. They found that in 1981 only six companies were using CBT, all six being computer companies. Only one year later a further 18 companies had taken up the techniques. In the main, however the UK experience is that it is the larger groups who are endorsing CBT. British Gas for example has introduced CBT into its 12 training departments. CBT has been chosen for 'traditional' areas of training such as codes of practice and clerical and financial procedures as well as for decision making simulations for management training.

The Manpower Services Commission employs more than 20,000 people throughout the UK and has adopted a CBT complement to their training with courseware materials, generated in-house using the Pilot authoring language. Another large employer Provident Financial Group, as a result of a 30% turnover problem amongst the 1500 local managers in its Personal Credit subsidiary, has employed CBT techniques to improve the selection skills of its personnel management groups. CBT based on interactive video has been at the centre of a major training drive undertaken by Shell (Bayard-White, 1987)²⁴ in an effort to improve accident prevention awareness amongst its off-shore oilwell operatives. In a three month period 750 employees used the packages "with enthusiasm" and Shell management felt that it had been a cheaper method than conventional training.

The Government is currently establishing a new framework at national and local level which will ensure that training is carried out on the scale and with the quality required. At local level, groups led by employers will form Training and Enterprise Councils (TEC's). TEC's will examine the local labour market, assessing key skill needs, prospects for expanded job growth and the adequacy of existing training opportunities. They will then draw up a plan to suit those needs.

Another interesting example of training at a distance is the creation of *Information and Community Centres* (ICSC's) in DENMARK. The main aim of ICSC's is to provide isolated village communities with access to telecommunications services. Instead of linking the individual households onto a network, IT facilities within specially designed 'telehouses' are used. Such telehouses contain teleprinter, facsimile transceiver, interactive videotex and personal computers, which are at the disposal of the entire local communities involved. The facilities are intended both private and commercial use, with satellite TV reception, teleshopping, interactive citizens' advice services, etc. The telehouses are providing the village community with six basic services: consultancy services to firms; distance working information retrieval; national and international communication and the centre for the local community's cultural and political life; and last but not least training and education. The telehouse is offering educational packages combining computer aided training and study groups using the video communication facilities with access to a university like for example the University of Vemdalen with the University of Odense. The ICSC initiatives are really social experiments with Information Technology

A lot of other initiatives are taking place on national level. Europe has a leading position in terms of training, pedagogy, training and methodologies and the development of comprehensive training and education provision.

Education and training is becoming a crucial factor due to a combination of increasing pace of change and the increasing complexity of technology aids creating a need to improve skill levels in education, retraining and redeployment.

However some factors still limit ongoing and emerging projects on flexible and distance learning as eg, separation between education and industry, virtually no multilinguality, poor interactivity in tutoring systems, no common unifying infrastructures and few attempts to investigate pedagogic aspects in the use of advanced technologies.

²³Manpower Services Commission (1983), *Looking at Computer Based Training*, Mills and Allen Communications Ltd.

²⁴Bayard-White C. (1987), *Past Experience on the Platform*, Audio-Visual, pp. 46-49.

The following recommendations were therefore given by the European Round Table Standing Working Group on Education (1989, p.8-14)²⁵:

- 1 Revitalisation of basic education by applying new tools and methods like Computer Aided Instruction, satellite programmes, etc...
- 2 Improvement of the cooperation between Industry and educational institutions.
- 3 Importance of technical and professional education in a life-long learning model
- 4 Transferability and compatibility in education and development of European education as well as the promotion of the use of modern technology in enhancing the compatibility of education.
- 5 Facilitating life-long learning and adult education

As we will see in the following these problems are not typical for Europe but are common to all Open and Distance Learning projects.

3. FLEXIBLE AND DISTANT INITIATIVES IN THE EASTERN COUNTRIES

The right to distance education forms part of the constitution of the USSR (Article 45);

"Citizens of the USSR have the right to education. This right is ensured by free provision of all forms of education ... by the development of distance and part-time education courses ... by the provision of facilities for self-education."

The objectives of DE in the USSR are closely tied to the efficient training of skilled manpower. Ilyin (1983)²⁶ justifies the role of HDE in the USSR in four points:

- better training of specialists by the combination of studies and work;
- DE costs two or three times less than full-time education;
- the work/DE combination prevents students from switching professions after training which 15 - 20% of conventional graduates do;
- conventional graduates need two-three years of work before mastering their skills.

The clientele for post secondary DE in the USSR is huge, involving some 1,5 m students or 30% of all students in institutions of higher learning (Ilyin 1983)²⁷. Entrance is on the basis of competitive examinations. There are 14 specialised distance teaching universities (DTUs) and 800 distance subsidiaries and branches of full-time universities and institutes offering a complete range of programmes. The technology of Soviet DE involves correspondence courses (study guides and textbooks) and some television on a national educational channel. Its distinguishing feature is the 30% of study carried out in face-to-face settings, sometimes called the "consultation model". Soviet DTUs operate branches across the nation (eg 23 branches for the USSR Financial and Economic Institute for Distance Education which has 32,000 students). Students are given paid leave from work to keep up with their courses and attend lectures and practical work at these branches.

It is too early to know what impact the emphasis on openness (glasnost) introduced by Mr. Gorbachev will have on distance education. We also have too little information as yet about what is going on and which changes are occurring to describe definitive trends.

²⁵Ibid.

²⁶Ibid.

²⁷Ibid.

In Czechoslovakia most further education is carried out in the form of post-graduate studies with existing institutions and universities. These studies usually last for 4 semesters with 2 or 3-week meetings per semester. Lectures are read by experts on a variety of topics. In industry, managers and government officers (state administrators) follow courses of shorter duration, directed toward management topics.

For secondary school leavers who are employed, special in-service courses are organised which lead towards a technical diploma.

There is a wide expectation that a broad range of activity for postgraduate training of employees, will be introduced as a result of new economic reform. Presently, as far as we know there are no major Distance Learning routes using technology to gain further qualifications. Individuals wishing to develop themselves have to engage in very classical external forms of study, where lectures are held during the weekends. Information is provided in condensed lectures and literature for "home study". The frequency of such classes depends upon the faculty.

In Hungary the existing system for employees is not a real Open and Distance Learning system as it is known in Europe or the US. There are evening and correspondence courses held at universities and there is a system of post-graduate studies for those who are employed on a full-time basis. Some will obtain a higher education degree and others, who already have this, will embark on a post-graduate course.

The trend within the enterprises is to reduce the number of education days an employee can have, so affecting and reducing education leave. Enterprises are under considerable pressures to change and become competitive, which in turn, makes them rethink the ways they have traditionally accounted for their financing. New ways of accounting creates pressures to justify expenditure and this could be one reason why today, enterprises are less likely to finance courses.

Presently, as far as can be ascertained, there are no major open and distance learning systems which utilise technology in the learning process. There are however plans to establish in the near future a computer based network independent of government and industry to interface with other European networks with the purpose of gathering information on training programme. This network should link 25 local centres equipped with IBM-compatible PCs in local area networks. These centres should again be linked to local institutions (research institutions, schools, private companies) which could use the local centre as an information and documentation-centre.

The Polish situation is very similar to Czechoslovakia. The desire to change and implement new systems is strong. The need is to improve the ability of enterprises to cope with "quality and provision of services" at home and in the National Economy.

The estimation of the short term training needs in the different sectors was that 27,000 Russian language teachers needed training, 2000 local government officials, 5000 top level managers, 50,000 middle level managers and 100,000 employees needed training in the subject of new technology, 600-800,000 had to be retrained from public employment to work in the private sector, 100,000 in the financial sector. In the longer term it was estimated that a substantial part of the 7 mio workers and 1 mio engineers would need retraining. A number of initiatives to overcome these retraining needs have already been established. Distance teaching methods are regarded as best suited to meet the huge need for retraining especially in the industrial and financial sectors, where the key personnel could not be taken out of production for longer periods. To establish a distance learning system it can be estimated that there is a need for 50 TV studios with satellite connection and equipment for production of programmes and editing equipment for adoption of foreign programmes. The Polish approach differs from the Hungarian one. The focus is not on

infrastructure on the longer term for distance and open learning but on basic equipment and short term retraining needs.

4. FLEXIBLE AND DISTANCE INITIATIVES IN NORTH AMERICA

4.1. DISTANCE EDUCATION

North America is dominated by two federal countries, Canada and the USA. Their national governments have little jurisdiction in educational matters and in neither case have they played any role in the development of Distance Education (DE). This is almost as true of the provincial and state governments, which do have authority in educational matters but have usually left Distance Education initiatives to existing institutions.

Exceptions are British Columbia, which set up the Open Learning Institute and the Knowledge Network, and more recently Ontario, which has established a Northern Ontario Distance Education Access Network.

Against this background the distinguishing feature of DE in North America is its very diversity. Institutional free enterprise has given rise to hundreds of programmes serving an array of objectives and using various technologies. For the USA 70 universities offer college-level credit courses to some 150,000 students. His survey shows that the typical programme is located at a Mid-western university, had 2,055 college-level correspondence enrollments in 1981-1982 and had a full-time staff of seven and a half persons with all faculty teaching on an overload basis.

The Jason project, starting in 1989, aims to allow 500,000 children DE of the Mediterranean sea bed by a satellite link from a submerged explorer vehicle to a series of fully interactive control centres based in major museums around the USA. This is being done by the team who located the Titanic in 1986.

Canada also has a number of conventional universities that offer correspondence courses, for example Waterloo which has the largest English-language programme (300 courses, 20,000 students) and Laurentian which offers courses in both the English and French languages. Recent focus has been service to minority groups: this is also linked to the fact that, in the specific geographic situation of Canada - where the huge majority of the population lives in a small fringe of land near the US-border whilst the rest is dispersed over vast territories, the principle of "equal opportunities" also applies to people living in remote sites where technology (e.g. Direct Broadcasting Satellite (DBS), Very Small Aperture Terminal (VSAT) & Provincial Education and Entertainment Transmission Service (PEETS) i.e. satellite downlink and microwave transmitter) provides the only way of reaching them. Like Australia, Canada has generated a literature of distance education that is disproportionate to its size. Recent books in English (Mudridge and Kaufman 1986)²⁸ and French (Henri and Kaye 1985)²⁹ are good examples. English-Canadians agonise over the use of electronic communications in distance education. French-Canadians, who mourn the loss of a somewhat idealised teacher-student relationship, stress the importance of structure.

²⁸ Mudridge, I and Kaufman, D., (1986) *Distance Education in Canada*, Croom Helm, London.

²⁹ Ibid.

4.2. TRAINING

Training is a successful business in the United States. Researchers estimate that 30 to 100 billion dollars (30 000 to 100 000 MECUs excluding trainee's wages) per year is spent by the private sector on formal employee training in the United States³⁰. This figure is supposed to increase by 5% per year. About 30% of this amount is related to computer-based training, 2% to interactive video (up to 8% in 1992) and 2% to teleconferencing (which means satellite broadcasting).

A most recent survey (1989) by Training Magazine determined that US organisations with 100 or more employees have budgeted 39.6 billion dollars for formal training in 1989³¹. This investment is however concentrated in a small number and type of industries.

Yet companies are not compelled by constraining laws to spend any amount of money on training. The state, or employers, or employees organisations are not involved in the company training. But there is a general feeling among the corporate management that training is a strategic investment.

As in other areas of ITT&B development, training in the USA is determined by short term demand factors rather than long term strategic planning. This point is made in the RACE strategic document "Establishing Advanced Communications in Europe" (1990). There have been moves more recently in the USA to create a context for ITT&B planning but the situation is still best characterized as unplanned. This means that new initiatives are exposed at an early stage to the disciplines of the market. Many projects are therefore curtailed before realising their potential. This seems to be one factor behind the move towards smaller scale or sectorial projects with a high level of quality assurance.

When it is said in Europe that the introduction of new technology in the learning process meet cultural obstacles it is, no doubt, in comparison with the general open American attitude towards TV, computers and high technology. Another reason for the positive feeling towards technology and telecommunication investment is the distance between the various establishments of a company, often sparsed all over the country, larger than all of Europe.

There are no such aggregate estimates for Canadian employers but only scattered information such as:

- a 1987 statistic survey of human resource development and training found that employers spend about 1.4 billion or less than 0.3% of Canadian's Gross Domestic Product on training - half of US employers on a per employee basis³².
- the Canadian banking industry spent 113 million dollars on formal training in 1985³³
- the automotive industry in Canada spent 75 million dollars on formal training in 1984 and estimates such expenditure will grow to 200 million by 1990;³⁴
- The Canadian Business Task Force on Literacy estimates 1.2 billion dollars is spent annually on formal training by firms in Canada³⁵.

³⁰Jothen, K. Training in the B.C. Electronics Industry, Phd, Vancouver: University of BC, 1985.

³¹feuer dale, National Training Survey, Training Magazine, nr 10, 1988.

³²de Grandpre Advisory Council on Adjustment, op. cit.

³³Province of Ontario, Breaking New Ground: Ontario's Training Strategy, Toronto: Queen's printer, 1986.

³⁴Employment and Immigration Canada, Automotive: report of the automotive industries human resource task force, Ottawa: Supply and Services Canada, 1986.

³⁵Canadian Business Task Force on Literacy, op. cit.

Whilst estimates of Canadian firms providing employee training range from 17 percent to 60 percent, these rates vary depending on the nature of the training and the companies providing it. The larger the firm, the greater the frequency; but smaller firms are more apt to provide on-the-job, informal training. A recent Canadian Federation of Independent Business survey found that two thirds of its members provided informal, on-the-job training. Studies indicate that training rates are highest in the finance, insurance and real state, manufacturing and mining sectors. This is due to the impact of technology on production processes and office procedures. On the other hand, training is least prevalent in the construction and transportation, communications and utilities industries. In terms of training lasting a year or more, the construction and manufacturing industries have the highest training rates - due to the relatively high prevalence of apprenticeship training in these industries.

An important issue in British Columbia, and this refers also to Canada as a whole, is small business training. Most surveys exclude firms with less than 20 employees and some exclude even larger firms - yet this sector is responsible for almost all job growth and will continue to be. In spite of relatively low rates of formal training in small businesses, it is important to consider the unique barriers facing this sector in order to facilitate workplace training.

Who participates in training in terms of the proportion of the labour force participating in employer-based training? All these studies vary in definition and scope and it is therefore difficult to determine trends in employee training:

- Past Canadian census' revealed that 7 and 8 percent of the country's labour force took part in such training in 1969 and 1973, respectively³⁶;
- A study commissioned by the Skill Development leave Task Force found that 18 percent of employees in firms surveyed participated in skill development leave programs sponsored by employers³⁷;
- The Survey of Adult Education in Canada found that 18 percent of all adult education participants in Canada in 1983 were employer-sponsored; and 42 percent of all participants in job-related training were employer-sponsored³⁸;
- An Ontario study showed that 13 percent of Ontario's full-time workforce participated in employer-based training in 1985³⁹;
- The Statistics Canada Adult Training Survey found that 6 percent of the Canadian workforce (or 108,000 British Columbians) participated in employer-based training in 1985⁴⁰.

Market research and analysis undertaken during the planning and feasibility study for "Knowledge Network II" revealed a significant trend toward growth in training in sites located outside the large metropolitan centres, and a clear commitment toward open learning methods and distance education. Non-campus-based training as well as an increasing

³⁶Statistics Canada, Labour Force Survey: Training in Industry, 1973, Ottawa: Supply and Services Canada, 1975; Statistics Canada, Training in Industry, 1969-1970, Ottawa: Supply and Services Canada, 1973.

³⁷Social participation Evaluation Group, A study of Skill Development Leave Programs in Canadian Business and Industry, Kingston, Ont.: Queen's University, 1983.

³⁸Statistics Canada one in every five: a survey of adult education in Canada, Ottawa: Supply and Services in Canada, 1984.

³⁹Ontario Ministry of Skills Development, the Training Decision: Training in the Private Sector, Toronto 1989.

⁴⁰Statistics Canada, Adult Training Survey, Ottawa, 1986.

demand for local access to educational opportunities are evident among companies and end users. The review noted:

- employers are increasingly expressing a willingness to allocate funds for worksite-based training programs;
- educational institutes are expressing interest in being originating as well as receiving sites
- the classroom is increasingly being extended into the community and the workplace
- there is a growing recognition of the need to continually train and upgrade employees rather than relying on an influx of new workers;
- leading commentators argue that the growth in open learning requires that societies develop new and innovative ways of meeting progressively differentiated information and learning needs;
- there is a need to differentiate between, and therefore differential respond to, basic education, training, retraining, skills upgrading, and professional development.

4.3. TELECOMMUNICATIONS AND LEARNING

Materials reviewed pointed to the increasing development of innovative distance education systems using a range of telecommunications technologies. Studies discussed the educational use of video, audio, and audiographic technologies in distance education. Particular attention was given to sources which provided some evaluation of the technology (including electronic blackboards such as the MTIOPTTEL system in Alaska, the OPTTEL system used by institutions in Alberta, and British Open University's CYCLOPS; Slow Scan TV; VSATs; and full two-way audio/videoconferencing). Major findings suggest:

- reliability of the technical/delivery system is critical. Many trial projects fail because of inadequate support services;
- delivery systems must allow for a variety of input and output modes;
- they must be easy to use, cost effective, and adaptable to local conditions and changes.

The following are examples of systems using these technologies that are planned or currently in operating respectively in Canada and the United States.

4.3.1. Canada

Canada is in the same technological environment as the US, with in many cases more willingness to cooperate with European organisations. They confront a more important obstacle with the extent of the territory, so many distant-learning experimentations are under way. Satellite-based systems have also a large audience, 8 transponders, 70 TV programmes are available in the Canadian territory as well as three corporate training.

In 1987, the Ontario Government established the Contact North/Contact Nord telecommunications delivery system to extend formal education opportunities to residents of Northern Ontario. Contact North/Contact Nord operates a network of electronic classrooms located in remote communities. Each classroom or "access point" has an on-site coordinator and is equipped with a variety of educational technology devices to enhance and deliver distance learning. These technologies include IBM and ICON computers, microphones and speakers for audio-teleconferences, facsimile machines, and audio and video tape recorders. Any university, college, or secondary school in Ontario can utilise the network for delivery of courses and for conducting meetings. Non-profit groups may use the network for educational and training activities. This network's \$5 million annual budget covers both course development, delivery, and receive site costs.

Saskatchewan's SCAN NET (Saskatchewan Communications Advanced Network) was launched on January 1, 1990. This will involve a closed network to include 100 learning centres across the province. The principal objective is to establish one highly sophisticated shared-use system for the province which will be utilized by government, non-profit and business sectors for delivery of programming to widely dispersed audiences. Linking 100 specialised community access learning centres will enable the delivery of specific programs to speciality groups such as university and college students, local professionals, medical and health care personnel etc. The centres are to be equipped with a television, teleconferencing facilities, computers and a FAX machine. The intent is to locate one of these centres within reasonable driving distance for the majority of residents in the province.

BELL Canada is promoting its videoconference software system called GTCS which uses ISDN for the piloting of the entire system.

Ottawa University has proposed for many years a telephone distance learning system. Now researchers work on providing images and slides to distant a PC on a single telephone line. The system is run at very low cost and reaches many isolated people.

4.3.2. The United States

An interesting feature of the American training is the extensive use of satellites. 70 satellite-based business TV networks are in use in the US, many of them dedicated to training and education.

In the last five years a number of successful communications systems have been set up in the US to provide education and training programs such as:

The National Teleconferencing Network (NUTN) is a consortium of over 250 US educational institutions who produce live video professional development, training, and credit courses. NUTN provides a marketing and support function for member institutions who wish to originate or receive programs and members are also connected via a database for information on upcoming NUTN programs. Each site pays NUTN a one-time initiation fee, an annual service fee, and 15% of program origination revenues. The PBS Adult Learning Service is similar to NUTN in providing a user-pay comprehensive video communications service.

Educational networks are also extending to the business community, as companies develop onsite, interactive training centres linked to private and public institutions. One such network is the National Technological University (NTU), one of the US' leaders in distance higher education and training. It has served as a model for EUROPACE. NTU acts as a kind of clearing house for the delivery of technical learning programmes. It is described as a co-operative effort of 29 major engineering colleges to provide high quality, career-long education as well as non-credit courses and workshops on advanced technology to 220 corporate and government research sites nationally (NTIA telecomm 2000: Charting a Course for a new century, NTIA special publication 88-21, 1988). Amongst its participants are found AT&T, DEC, GE, HP, IBM, Motorola, NCR, Xerox... The engineering colleges are responsible for developing courseware for NTU courses.

NTU broadcasts six Masters in Engineering programs and a range of professional development sessions by satellite to receive from sites across North America. In January 1989 NTU began broadcasting full-time on transponder 8 of the GSTAR 1 space satellite. The resulting addition of two full-motion, colour ITV channels on this transponder doubled NTU's broadcasting capacity. At present NTU is starting to deliver interactive technical assistance programmes to business entrepreneurs at or near their work sites and videoconferencing to join the experts 'live' via satellite. The main goal of NTU is to explore, develop and use advanced educational and telecommunication technologies in delivering

instructional programs to graduate engineers and technical professionals (SMEs as well as the major corporate market) at their employment locations. Science classes are also available via live video from the University of California.

Seven technical programmes lead to a Master of Science degree awarded by the NTU. NTU offers 10,000 hours of graduate instruction a year, along with 1000 hours of interactive education and research teleconferences. Over 5,300 technical personnel have completed graduate courses in the past four years. More significantly, 45,000 participated in short courses and tutorials in 1988-89 alone.

The Hospital Satellite Network and the American Rehabilitation Network provide Health professional development on a membership plus fee for activity basis. Schools networks such as Ti-In Network and Star Schools provide a range of teacher professional development and high school instruction. In 1988 the programme awarded \$19 million in grants to four regional partnerships. The grants were expected to serve students in more than 1000 schools in 39 states (US Department of Education News Release, "Education Department launches Star schools programme", Oct 1987).

A multimedia format and a comprehensive approach to communications, support, and a fee for service have been successful for these site-based education and training delivery systems.

Public Broadcasting Service (PBS) is a national organisation funded by 320 independent TV stations which supply programmes to these stations all over the USA. It is also sponsored by the federal government, and does not allow for advertisements during its programmes. In particular it has developed since 1981 the Adult Learning Service (ALS): the learners attend a college but the class is taken via TV programmes with the help of booklets. Since 1988 an Adult Learning Direct Satellite Service is proposed since the majority of colleges have receiving equipment. It permits in addition live videoconferences.

Anneberg/CPB: Corporation for Public Broadcasting is also a private firm producing non-commercial TV programmes of a very high quality on Statistics, Chemistry, Physics and French. They have gathered teams of pedagogic experts, media experts, teachers, etc...Each course costs up to 2 MECUs. These products are then circulated by PBS, by Cable Networks, by tapes on sale or in public libraries. It participates in the "Virtual Class" distance learning project with New Jersey Institute of Technology, proposing various multimedia learning activities around a microcomputer.

IBM uses as many as three independent satellite-networks for its needs. Two of them are dedicated to training; ISEN and CENET. IBM spends 100 MECUs only on satellite-based training. The efficiency has been carefully assessed, and it is used principally for technical courses with evolutive content. The instructors are systematically associated in the design and animation of the course.

DEC has also developed a Digital Video Network, DVN, for its own uses. designed at first for fast, homogeneous and broad communications, it is now used at 70% for training. The staff judge positively this means of learning and in addition the management process the network for the economy of time and money procured.

A 3Gbits data network that would link education and research supercomputing centres around the US is also planned (federal high performance computing programme/ Office of science and technology policy communications News, June 1989).

Individual teleservices:

Teleworking: One estimate is that by 1993 5 million Americans could be teleworkers. Organisations from the private or the public sectors are already engaged in teleworking experiments, there are J.C. Penney, Travellers Corporation, Levi Strauss, The US

Governments Office of Personnel Management and the California Public service Commission (Office at home, American Demographics, Dec 1988)

Home teleservices: Several BOCs and other firms are conducting trials or already offer teleservices directly to subscribers. These services are mainly electronic banking, shopping, information, conversation and entertainment. It is estimated that currently 1.6 million customers use available services (Bells go on-line, Communications Week, May 8, 1989).

Services for disabled people: Services like TDD (Telecommunications Devices for Deaf) are already in use or under development with the possibility of using synthetic speech for the next generation of equipment prepared by AT&T and IBM. A Telecontrol system for elderly people based on an intensive use of mobile or cordless telephone is also under trial and implementation.

4.4. LEARNING AND INFORMATION TECHNOLOGY

Education and Training in the USA has consistently made extensive use of Information Technology. Whilst use and experimentation tends to be fragmented, the overall scale of use is greater than in any other country. Audio, video, remote graphics and computer conferencing techniques are widely used in many universities and a large number of corporations. In several cases (particularly in medicine) this involves extensive use of satellites. Satellites are being used in Education and Training by, amongst others, the Learn Alaska scheme, and the National Technology University. Several experiments involve the use of cable television, notably the Oklahoma two way talkback system, Reading and Spartanburg. Videotex is also being used as part of agricultural extension schemes.

The most visible developments have been the university based projects at MIT, Brown, and Carnegie Mellon (amongst others) which have thousands of microcomputers within powerful networks for supporting existing teaching methods and evaluating new techniques.

Most of the major computer companies have a significant role in one or more of these projects.

Control Data Corporation (CDC) was one of the first in this area with the Plato system for Computer Assisted Instruction (CAI), and although this has only been a fair commercial success, it has become widely adopted for corporate training throughout the world.

Many US companies see education and training as a strategically important market. As a result, companies such as IBM are heavily discounting (or even donating) equipment used for education and training both in the USA and in Europe. IBM is particularly active in the use of communications networks for education and training.

Research into new multimedia workstations is being conducted at various locations in the USA. There is for example, the NeXT computer company's new multimedia workstation. There is also a venture capital funded product being developed on the Apple computer, which incorporates a facility for digital video editing; and there is an initiative by M.I.T. to coordinate multimedia workstation research and marketing for IBM compatibles. In all three cases the potential of the market for multimedia PC based technology has now been acknowledged. This represents powerful competition for the European market.

The Language Learning Centre of US Air Force uses systematically the Interactive Videodisc, since 1982. It built a unique approach and method of conception and realisation of the interactions needed, now included in the author-system Icon-Author. For their experts

the CD will become the standard for Interactive Video in three years, and anticipate the Microsoft CD-ROM and the CD-ROM XA for audio applications.

At present a new learning theory (the open-glass-box-theory) is being developed and tested through several experimental pilot applications at the Institute for Research on Learning (IRL-San Francisco). The Institute for Research on Learning is a non-profit institution founded by George Pake (Vice President for Corporate Research with Xerox Corporation), John Seely Brown (Vice President for Advanced Research at Xerox Corporation's Palo Alto research centre) and Greeno (Stanford University; University of Pittsburgh; member of national Academy of Education). Institute of Research on Learning is a unique research centre, designed to produce high level collaboration among researchers in the diverse disciplines that contribute to artificial intelligence. IRL's multidisciplinary work has already brought new insights about learning, both in conventional education, work environment and in the current use of new technologies. As a result IRL has developed new hypotheses about educational practices. And it has formulated research goals for investigating principles from which new forms of learning and new learning systems can be designed.

The Exploring System Earth Consortium (consortium of universities engaged in intelligent tutoring systems) has the primary sponsorship of Hewlett-Packard's Strategic Grants Program (2 million dollar per year) and the US Education's Fund for the Improvement of Post Secondary Education. San Francisco State University, in collaboration with the Universities of Hawaii and Massachussetts plus the San Francisco Community College District is developing Intelligent Computer Assisted Interactive (ICAI) software in the physical and biological sciences. They deliver to high school, community colleges and university classrooms and very recently to industry (via Hewlett-Packard). University of Rhode Island works on a problem generator, SFSU on simulations, and Tufts in Boston on connecting the system to transducers for real-time use in the laboratory; the University of Hawaii had been involved but has now lost its funding.

5. FLEXIBLE AND DISTANT INITIATIVES IN LATIN AMERICA

DE in Latin America presents a fascinating study. Nowhere is the enthusiasm for distance education greater. New projects, such as the Columbia open and distance education system are described with missionary fervour and with an abundance of organisational and planning charts (Gomez 1984)⁴¹.

The Asociacion Iberoamericana de Educacion Superior a Distancia publishes a bulletin that reports on developments in a number of countries. These have included operations within conventional universities such as the Universidad Abierta or UNAM in Mexico, the Universidad de Antioquia and the Universidad Javeriana in Columbia, and the Centro de Teleducacion of the Universidad Catolica of Lima, Peru. Anderson (1982)⁴² suggests that some 50 Latin American universities have made serious attempts to offer distance education but that "like grass fires on the savannahs" most of these initiatives have been short lived.

Two universities designed solely for DE, Venezuela's Universidad Nacional Abierta (UNA) and Costa Rica's Universidad Estatal de Educacion a Distancia (UNED) have been described

⁴¹ Gomez, H.S., (1984) Sistema de educacion abierta y a distancia: el modelo colombiano, in *Evaluation of Higher Distance Education Results*, UNEDC, Madrid, pp. 123-167.

⁴² Anderson, P.S., (1982) The Fires of Distance Education in Latin America, in Daniel, J.S. et al. Eds. *Learning at a Distance A World Perspective*, Athabasca University/ICCE, pp. 70-72.

in detail by Yopez (1984)⁴³ and Trejos (1984)⁴⁴. Rumble (1982, 1985)⁴⁵ has written about the evolution of both institutions. He finds that Latin American DE initiatives suffer from *proyectismo*, "the elaboration of ambitious plans out of all proportion to the resources available to implement them". Furthermore, there are often unrealistic expectations that the introduction of the technology of distance education will then remove undesirable features of the existing system.

Another problem is the availability of good-quality self-instructional material for distance and flexible learners. This becomes particularly acute in the case of many developing countries where the resources and people necessary for the development of good-quality materials might not be available and yet materials produced in other countries, which could be available are often irrelevant. They have to adapt these materials to local circumstances (translation, but also adaptation to local needs, learning styles, cultural identity). Intelligent tools for assisting them in these adaptations could be of great value. There is to be world-wide a growing market for off-the-shelf generic courseware provided it is presented in such a way that it is easily can be 'wrapped', adapted to not only local learning needs but also to linguistic and cultural conditions.

There is also a need for low-cost, mass-produced and adapted-to-local-environment workstations, not only for delivery of courseware but also allowing for distance tutoring.

6. FLEXIBLE AND DISTANCE INITIATIVES IN AFRICA

No continent has a greater need for distance education than Africa (Ansere 1982)⁴⁶ but nowhere is there a greater gap between need and supply.

Apart from the University of South Africa, which has expanded to 60,000 students (of which 13,000 are blacks) since it began as the world's first open university in 1947 (Van As 1985)⁴⁷, provision of DE in Africa has lacked resources and continuity. A striking example of shattered hopes was the Open University of Nigeria which was closed down for economic reasons almost as soon as it began (Omolewa 1984, Oduaran 1985)⁴⁸. Tanzania is another striking example of a country where education and DE are claimed to be central to national development but have languished because national development has not generated the economic resources to do much.

The greatest need for distance education in Africa is at the secondary and technical/vocational levels, a need which universities have been helping to meet (e.g. in Kenya see Gitau 1984, 1986)⁴⁹. Zambia offers university level correspondence courses with

⁴³ Yopez, M.R., (1984) *La organizacion al curriculum y la production de cubos: aspectos criticos en una institucion abierta y a distancia*, in *Evaluation of Higher Distance Education Results*, UNED, Madrid, pp. 99-121.

⁴⁴ Trejos, E.G., (1984) *La UNED DE Costa Rica y su desarrollo* in *Evaluation of Higher Distance Education Results*, UNED, Madrid, pp. 73-97.

⁴⁵ Rumble, G., (1982) *The cost analysis of learning at a distance: Venezuela's Universidad Nacional Abierta*, *Distance Education* 3 (1), pp. 116-140.

Rumble, G., (1985) *Distance education in Latin America: models for the 80s*, *Distance Education* 6 (2), pp. 248-255.

⁴⁶ Ansere, J.K., (1982) *The Inevitability of Distance in Africa* in Daniel, J.S. et al. Eds. *Learning at a Distance A World Perspective*, Athabasca University/ICCE, pp 53-61.

⁴⁷ van As, B.S., (1985) *Transitional study programmes at the Distance Teaching University of South Africa: a continuing experiment*, *Distance Education* 6 (2), pp. 223-234.

⁴⁸ Oduaran, A.B., (1985) *Nigeria's National Open University: A Study on Retrospect*, *ICDE Bulletin* 8, pp. 49-53.

Omolewa, M., (1984) *Introducing the National Open University*, *ICDE Bulletin* 6, pp. 41-43.

⁴⁹ Gitau, B., (1984) *Counselling at a Distance. The experience of Kenya's Correspondence Course Unit*, *ICDE Bulletin* 6, pp. 32-41.

some radio to 600 students (Siaciwena 1984)⁶⁰ but teacher education and upgrading have been the nearest thing to university-level work attempted on any scale in most African countries. Gitau (1986) describes Kenya's programmes for teachers and their cost-effectiveness has been assessed positively by the World Bank (Hawkrige 1982)⁶¹.

On the positive side, however, a significant amount of distance education workers have been trained in Africa in recent years and 29 African agencies active in distance education at some level responded to a recent survey conducted for the Commonwealth (IEC/CET 1987)⁶². With more resources and some international help DE could grow significantly in Africa in the years ahead. As in Zambia, a key goal of national development in Africa is to reduce rural/urban disparities and inculcate useful skills.

7. TRENDS IN FLEXIBLE AND DISTANCE LEARNING IN ASIA (JAPAN IS DESCRIBED SEPARATELY)

The most remarkable trend over the last few years has been the establishment of new distance education institutions catering for large numbers of students in several Asian countries.

Patterned after the British Open University, the first open university of the region, The Allama Iqbal Open University of Pakistan began admitting students in 1974. Since then open universities have been established in India, Indonesia, Korea, Sri Lanka and Thailand. In addition conventional universities in countries like Malaysia and China have expanded their off-campus programmes and China has reopened its central radio and television University. It now caters around 600,000 students. Thailand's Sukhothai Thammarithat Open University, founded in 1978, is planning on a target population of 500,000 students by 1990.

Indonesia's Universitas Terbuka, established in 1984 had over 250,000 students for its first courses and was able to enrol 60,000 in its first year of operation. The University of the Air in Japan, established in 1985, offers a mix of television, correspondence courses and attendance at study centres. The Correspondence University in the Republic of Korea, established in Korea has around 250,000 students registered in programmes. In India, the Indira Gandhi National Open University (IGNOU) was created in 1985, with a remit to provide the basis of for a national distance education system, as well as to coordinate the activities of the many universities which have correspondence departments.

The combined enrollments of these programmes have now reached over 2.5 million, more than 25% of all the world's students enrolled in distance higher education.

Until recently, there has been little evidence that Asia's distance education institutions were fulfilling their initial objectives. Newly completed research studies, conducted with support from the International development research centre (IDRC) of Canada, are now beginning to offer initial findings. The studies, conducted by the distance education universities in Malaysia, Indonesia, Pakistan, Thailand and China cover a wide variety of topics from student characteristics to media mix to occupational benefits. However these studies are

Gitau, B., (1986) A Case Study of the School of Distance Studies of the University of Nairobi, Kenya, ICDE Bulletin, 11, pp. 59-68.

⁶⁰ Siaciwena, R.M.C., (1984) Introducing Radio Broadcasts to support Correspondence Courses at the University of Zambia: Initial observations, ICDE Bulletin 4, pp. 17-21.

⁶¹ Hawkrige, D. et al. (1982) In-service Teacher Education in Kenya in Alternative Routes to Formal Education, World Bank/Johns Hopkins.

⁶² IEC/CET, (1987) Commonwealth Cooperation in Open Learning, Commonwealth Secretariat, London.

scattered. So instead of a comprehensive assessment of distance education programmes in Asia, only a scattered view of studies and findings are available.

Student characteristics: the students attending open university courses are not the clients that originally were expected. For example, although the off-campus programme of the University Sains Malaysia is intended primarily for disadvantaged rural learners, in reality more than 50% of the current students are from three major cities. Universitas Terbuka was originally established to provide places for large numbers of secondary school graduates denied enrollment in conventional universities. But in fact it has attracted mostly older, employed married males. The portrait of the open university student for much of the Asian countries has become that of persons pursuing a second chance for university degree in the hope that it will help them to find a better job.

A more recent development is the growth of a clientele which is not even degree-seeking. More time and effort is being spent developing specialised degree-courses that either lead to certification or that custom-made for specific companies or institutions.

Regarding media mix, reports indicate that the most distance education programmes are based primarily on one medium: print. Attempts to use new electronic media have been not successful. Even where TV is used extensively, as in China, its potential has not been exploited in all its instructional meanings.

There are many reasons for this:

- shortage of production expertise
- scarcity of hardware for reception
- expenses of production and maintenance
- problems of access to appropriate broadcast time
- courseware developments
- cultural and language adaptations

The only new medium that shows promise of a widespread use combined with print materials is audiocassette recording. Video can perhaps play a similar role. In contrast the use of computers has been extremely limited and restricted to a few specialised courses where students are able to come to well-equipped learning or training centres.

Another issue is the weak learner support in these countries. Typical reasons given for dropouts rates are high, above 60-70% were linked with untimely receipt of course material and late tutor feedback on course assignments. A recent research on an Indonesian University showed a falling back from 85% to 50% and less than 10% over three years by voluntary tutorial attendance. More innovation and implementation is needed on this domain. Also Impact, Assessment and forecasting studies, studies about the advantages of distance learning and business plan are scarce in these countries.

7.1. CHINA

China, home to one quarter of humanity, is expanding the provision of distance education rapidly. The objective is to meet the needs of the development of the national economy and of society (Jianshu 1987)⁵³ as part of the modernisation of education. Whilst the rationale behind Distance Education in China and the USSR is similar, the Soviet emphasis is on improving a well-established educational system whereas DE in China is part of a massive catch-up operation. In 1983 only 0.6% of the population were university graduates while 23.5% were semi-literate or illiterate. In relation to statistics like these, the numbers now involved in DE in China, impressive though they are in absolute terms, represent only a

⁵³ Jianshu, Z., (1987) Three major events in higher distance education: News from China, ICDE Bulletin 13, pp. 18-20.

modest beginning. But there is no lack of idealism. Staff are urged to gain "a deeper understanding of higher correspondence education in the cause of socialist economic construction, to get them to dedicate their lives to the development of higher correspondence education in China" (Jianshu 1987)⁵⁴. The aim is to provide DE to 20m Chinese over the next 15 years.

In 1983 around 1,000,000 Chinese, or some 40% of the country's university population, were studying at a distance. One third of this clientele was enrolled in the correspondence programmes that are offered by 311 of China's 800 colleges and universities; one third was associated with the Radio and Television University of China (RTVU) - a decentralized system of institutions; the final third was associated with the local TV universities which, since 1978, have "sprung up like bamboo shoots after a spring rain in China" (Yu Xu 1986)⁵⁵.

As in the USSR, entry to DE in China is by selection and there are close links with the work place. Jianshu (1987) reports on the unified entrance exam introduced in 1986 and taken by 1.3 m people. Many students at the RTVU branches are workers released full-time with pay. They watch the TV programmes in groups at the branches where they also have contact with part-time tutors. Although the TV universities are not "open" universities, the Chinese hope that the vast classroom without walls which they represent will, as a side effect, raise the educational ambitions of the population at large.

The programmes offered by correspondence in China cover a wide range of topics and lead to the same diplomas as on-campus study. The choice of courses from the TV universities is narrower but now expanding outside the original offerings of science and technology. A satellite TV teacher's college opened in 1986 (Jianshu 1987)⁵⁶.

The technology of correspondence teaching in China parallels that used in the USSR. Face-to-face contact accounts for about 30% of the total time that the student devotes to the five components of each course: independent study; lectures; submission of assignments; tests; examination and thesis. Because of the importance attached to staff-student contact the staffing ratios, at one full-time academic year per 25-40 students, are high compared to systems based purely on independent study.

China is pleased with the results of its DE and seeks to expand provision. Strong emphasis is placed on the quality of management as the determinant of future success. This is the major motivation behind cooperative projects with other countries. It is proposed (Jianshu 1987)⁵⁷ that all institutions offering correspondence courses should have a vice-president for correspondence education. In the TV universities there is awareness of the need to improve text materials and their links with the TV programmes. The independent thinking required by the present TV university format is seen as an advantage, however, in a country now trying to break a tradition of rote learning in its educational system. The new Chinese policy of encouraging personal initiative will, in all likelihood, give DE an even better image. Some institutions, such as the Shanghai TV University, would like to put greater emphasis on part-time learners and short-cycle programmes if the current emphasis on full-time students can be reduced.

⁵⁴Ibid.

⁵⁵ Yu, Xu, (1986) A look into some aspects of distance education in the People's Republic of China, *Distance Education* 7 (1), pp. 92-105.

⁵⁶Ibid.

⁵⁷Ibid.

7.2. INDIA

Faced with a huge unsatisfied demand for higher education and alleged corruption in its external examination system (a "challenge" examination arrangement), India turned to DE with the creation of the Correspondence Institute of the University of Delhi in 1962. Although the original intent was to create only one such institute per state and to limit enrolment in each to 10,000 they proliferated to the extent that 20 % of India's 133 universities now have correspondence institutes. Paul (1983)⁵⁸ describes one such institute and Datt (1982)⁵⁹ gives a profile of Indian correspondence students. The results of this shift to DE disappointed the Indian authorities. The clientele is only 115,000, programmes are mostly limited to arts and commerce and the technology used rarely goes beyond printed materials of inferior quality with occasional use of radio and study centres.

Reddy (1984)⁶⁰ lists the reasons why the correspondence institutes do not enjoy high credibility and describes the latest developments in DE in India. These are the creation of stand-alone open universities intended to bring to Indian DE the seriousness of purpose and professional competence that is lacking in the correspondence institutes. Carr (1983)⁶¹ describes the background to the establishment of the Andhra Pradesh Open University in 1982 and Singh (1985)⁶² reports on the creation of the Indira Gandhi National Open University (IGNOU) in 1985. This will be the keystone of a national system of Indian open universities. Furthermore the legislation creating IGNOU also gives it a coordinating role for DE throughout India. This signals the determination of Indian governments to use DE more effectively.

7.3. JORDAN

For various reasons DE has come fairly late to the Arab world. The creation of al-Quds University in Jordan is an example of the use of DE to try to change national characteristics judged incompatible to national development, such as a preoccupation with paper qualifications and a disdain for technical skills (Walid, 1988)⁶³.

7.4. PAKISTAN

Pakistan has concentrated its investment in DE in the Allama Iqbal Open University (AIOU), created in 1974 as "a People's Open University... to provide part-time educational facilities through correspondence courses, tutorials, seminars, workshops, laboratories, television and radio broadcasts and other mass communications media". AIOU's clientele is defined as "the masses" and degree work is intended to be only a small part of its programming. In 1983 about half of the 65,000 students were enrolled in degree courses. There is a strong emphasis on teacher education and some 60,000 teachers out of a potential market of 160,000 had taken the AIOU primary teachers orientation course by 1982. The other main focus has been general education at the junior college level (Fleming 1982)⁶⁴. The technology used by AIOU

⁵⁸ Paul, R.C.,(1983) Correspondence Education - the Experience of a decade in Punjab University, Chandigarh, ICDE Bulletin 3, pp. 32-38.

⁵⁹ Datt, R.,(1982) Problems of Distance Education in Developing Countries in Daniel, J.S. et al. Eds. Learning at a Distance A World Perspective, Athabasca University/ICCE, pp.63-65.

⁶⁰ Reddy, R.,(1984) Distance teaching in India: A profile of Andhra Pradesh Open University in Evaluation of higher distance education results, UNED, Madrid, pp. 283-305.

⁶¹ Carr, R.J.,(1983) Correspondence Education in India Universities: a change of direction, Distance Education 4 (2), pp. 187-194.

⁶² Singh, B.,(1985) International Seminar on "Distance Education: Experience of Open Universities", ICDE Bulletin 11, pp. 35-41.

⁶³ Walid, K.,(1988) The role of the al-Quds Open University in National Development, to be published.

⁶⁴ Fleming, A.,(1982) The Allama Iqbal Open University, Pakistan in Rumble, G. and Harry, K. Eds. The Distance Teaching Universities, Croom Helm/St Martin's, pp. 122-146.

consists of printed books together with radio and television broadcasts. Tutorial support in some 150 study centres is given for certificate courses.

After a rapid start and promising early results AIOU is experiencing some financial difficulties and suffering from the shortcomings of the country's communications infrastructure. The acquisition of its own printing press was an important step in reducing delays in the delivery of materials to students (Unesco 1983)⁶⁵.

7.5. SOUTH KOREA

South Korea set up a correspondence college within Seoul National University in 1972 to provide a 2-year programme to those who failed the national university entrance examination. Despite a drop-out rate of 70 % it was highly cost-effective and its graduates had a very high success rate in entry to the upper years of conventional university programmes. This college became the Korea Correspondence University in 1982 and now enrolls some 250,000 students in 5-year programmes in 13 subject areas. Admission is by lottery among high school graduates. The instructional strategy includes printed materials, assignments, radio programmes, a student newspaper, and two weeks of lectures per year at local centres associated with conventional universities.

7.6. TAIWAN

Taiwanese experience presents a fascinating contrast to DE on the mainland. Chen (1988)⁶⁶ reports that because of the traditional Confucian emphasis on the teacher as role model in a face-to-face setting, the National Open University of Taiwan cannot award degrees, even though its curriculum and examination standards are identical to those in conventional universities.

7.7. VIETNAM

Vietnam has awarded 50,000 degrees by distance education since 1960. The focus now is on the in-service training of workers, 30,000 of whom are enrolled in distance courses offered by 30 conventional institutions. The combination of correspondence tuition and face-to-face contact in local centres recalls the Soviet distance education model.

8. FLEXIBLE AND DISTANCE LEARNING IN JAPAN

8.1. INTRODUCTION

In Japan the situation in education and training is again similar to that in other areas of ITT&B. The Japanese take a long term view of training provision both in relation to the individual employee in receipt of training and in relation to planned support systems.

Unfortunately, European knowledge of technical and infrastructure developments in Japan is not good. Part of the reason for this lies in the rather secretive way in which many Japanese corporations have developed their training systems and plans. The same applies for the knowledge on the use of IT&T in education and training. In addition the general knowledge of IT&T in public education is so poor that former attempts to conduct a survey could not be conducted (IDC Japan report, Japan's schools to join the computer, Vol 15, p. 87-96).

⁶⁵ UNESCO, (1983) Distance Education in Higher Education, Bangkok, pp. 73-97.

⁶⁶ Chen, S., (1988) Creating the National Open University in Taiwan, the influence of Cultural and Educational Factors, to be published.

Information prepared for the Commission in 1986 suggests that dedicated infrastructure development for training and education, and the development of dedicated hardware, took a low priority up until the mid-1980's. A report for the OECD showed that in almost all categories of research on learner systems the Japanese lagged behind the other Western economies. From that point on however the Japanese have given training and education a very high priority. Although they have only recently begun to develop training and education systems in a coherent manner, they have significant infrastructure advantages over Europe and the USA.

This derives from the organisation of intelligence gathering in the Japanese industrial system. Japanese corporations have already built sophisticated electronic networks to assist in industrial intelligence gathering. These include dedicated infrastructures linking Corporate headquarters with all subsidiary offices, often on a world-wide basis. Under the direction of MITI Japanese corporations are obliged to share intelligence. We understand that this has led to the creation of inter-firm networks. At the hub of the networks are intelligence databases on world markets and on competitor corporations world-wide.

The infrastructure created for intelligence gathering now represents a considerable asset for training and education which can be provided as a value-added service without additional infrastructure investment.

With an infrastructure programme assured, Japanese electronics companies are focussing on producing the hardware and software to facilitate user-friendly learning at a distance. This market is now recognised as important and the Japanese will target it in the same systematic manner that they have targeted others.

A few specific characteristics (but we do not pretend to be complete) of the Japanese situation may explain why the penetration of technology is better in Japan than it is, for instance in Europe.

- technology is available (prices in absolute values however are comparable to the European ones and well above sme process in the USA)
- Automobile transportation within major cities is very difficult
- Acceptance of technology is very high
- New graduates out of universities join industry on precisely April first. This means that industrial companies are faced with a massive arrival of young people all the same time. Much of the training/education must therefore be provided to many people in parallel.

8.2. DISTANCE EDUCATION

Education and Training are given a very high priority in Japan. Use of IT in school and university is limited, but this is likely to change with new government policy. There are regional plans for the introduction of computers into schools, and Fujitsu has targeted this as a major area (as illustrated by the Hiramatsu Gakuin integrated school scheme). The Japan University of the Air (Hoso Daigaku) started in 1983 and now has over 10,000 students.

Japan kept the world waiting for 16 years, from 1969 to 1985, while it planned and designed its University of the Air. Separate from the existing correspondence provision of Japanese universities, this new institution was established in 1985 to offer liberal arts programmes in domestic science, industrial and social sciences, and cultural and natural sciences. These are

4-year programmes aimed at both adult students and high school graduates. The student's weekly commitment of approximately ten hours is divided between TV (3 hours), written material (4-5 hours) and attendance at study centres (3 hours), (Yabe 1983)⁶⁷.

8.3. INFORMATION TECHNOLOGY AND EDUCATION

Despite the fact that Japan has a world leader position in computer usage Japan's public school system are behind the rest of the industrialised world in computer usage and education. To take steps forwards the Ministries of Education, Home Affairs and International Trade and Industry have been organising and implementing plans to facilitate computer education in Japan's public schools systems. A first phase had a budget of Y8.3 billion to introduce PCs, word processors, video decks. A second five-year phase (90-94) swells from Y5.5. billion in 1990 to Y13.2 billion in 1994 and cover more software expenditures. Software will include computer aided instruction, school administration packages etc...

A factor inhibiting computer usage in Japan's schools is a shortage of teachers qualified to teach computer courses. Of a total of 937,220 public school teachers in 1989 only 137,323 or 14% could even operate computers with only 45,137 of these capable of teaching computer courses.

8.4. INFORMATION TECHNOLOGY, TELECOMMUNICATIONS AND TRAINING

Individual spending on Education & Training is high; this, combined with high spending on communications and consumer electronics has presented a market for Education & Training in the home which hardware and courseware suppliers are now actively exploiting with a number of products, some of which are based on the MSX and MSX2 microcomputers.

There is also significant activity within Japanese corporations. Although a high degree of confidentiality is maintained, it appears that Fujitsu, NTT, Matsushita, Mitsubishi, Hitachi, Toshiba and Sony are all active in this area. Several of these companies have internal training systems which are based on IT, including extensive use of Computer Aided Instruction and Computer Aided learning, interactive videodisks, and audio-and videoconferencing. Further development of IT, including NTT's Integrated Network System, will provide the basis for further exploitation of this field.

8.4.1. Fujitsu

Many Japanese corporations with an involvement in IT+T not only have their own electronic infrastructures. They are able to approach the training and education market with considerable experience of internal computer-aided and distance learning projects. The strong emphasis on human resource development in Japan is reflected in high training budgets (often equalling total R&D expenditure). This implies a greater degree of familiarity with the problems of adult learning than is found in Europe. Fujitsu is a good example of this.

Fujitsu is Japan's largest computer manufacturer. The company employs 60,000 people. At age 35, every member of staff is entitled to a 3 month off-the-job training course. The company produces over 100 training videos each year, and has its own Corporate Information Network System which can be utilised for distance training.

⁶⁷ Yabe, A., (1983) *The University of the Air, The Role of Distance Teaching in the Development of Lifelong Education*, Korea Correspondence University, pp. 250-268.

Fujitsu undertook a number of development projects for its internal purposes and some of these are now on the open market. Of particular relevance is the SCHOOL family of products. SCHOOL stands for System for Computer Helped Operation of Learning.

SCHOOL-ACE - Advanced Courseware Editor.
SCHOOL-CAL - Central Support and CAL Systems Management Software
SCHOOL-NET - LAN Support software
SCHOOL CMI - CAL package and data library control system

SCHOOL series software operates on the Fujitsu FM-7 and FM-16 personal computers. FM-7 is designed for home, primary and junior school use; the FM-16 for adult education, high school and university.

Another system worthy of note is KAPITAL. In conjunction with the KANAZAWA Institute of Technology Progress, Fujitsu has developed a LAN-based "total education system" using personal computers with a main frame host. The Host provides a relational database to build, manage and analyse curriculum management data, application management data, student data and result data. It also provides access support to applications library, hard disk server support for intermediate store between personal computer and host.

8.4.2. Toyota

Toyota, like all Japanese companies, places a high value on staff training. The company has invested \$100 million in a new University designed to take Toyota employees. Employees however make up only 20% of the University enrollment. Information is not available on the technology support systems employed at the University. Overall expenditure illustrates, however, the company's commitment to training. Toyota is also a shareholder in Teleway Japan Corporation, a new telecommunications common carrier and we can expect that the company will seek to utilize its network for training purposes.

8.4.3. INS

Expanding the market for distance training is integral to the development of Japan's Information Network System. It is promoted by NTT, the former PTT monopolist, and based on the international 64kbps ISDN standard. NTT plans a second phase of INS based on 1.5. or 2Mbps. The service features the following elements: video-conferencing, high speed fax, improved viewdata (i.e. photovideotext and voice), digital graphics and the interconnection of terminals of different speeds and types.

In the home, INS is expected to provide basic distance learning - though this may simply refer to an extension of company "acculturation" programmes. Information provided to the Commission suggests that a joint venture between NTT and NEC, Hitachi, Fujitsu and a major software publisher, will develop the network for on-line training and education delivery.

9. FLEXIBLE AND DISTANCE LEARNING IN AUSTRALIA

9.1. INTRODUCTION

Australia presents many difficulties peculiar to its size, population and its relative isolation until recently from the rest of the world. The state of Western Australia, for instance is more than three times the size of the state of Texas. With its large area of 3 million square miles and its relatively small population of 16 million people great distances are involved between groups of people, the majority of whom live on the east and south coasts.

The development of Australia as modern state took place as a result of Anglo-Celtic migrations from the British Isles. After the second world war the British influence declined somewhat with increased migrations, firstly from other European countries and in later years from Asia. Independence came quickly to Australia with many states gaining self-government in 1855. The British influence has varied considerably and now, at least in the cities, Italian, Greek, German, Dutch, Polish, Yugoslav, Turkish, Chinese, Vietnamese and other languages are widely spoken and printed. As well as introducing diversity and multicultural plurality these immigrants brought another gift to Australia; their skills and expertise, so obviating the need for an independent and strong educational system. This dependence on outside sources of skilled labour has created a situation of relatively low participation in Higher Education. As late as the 1950s, fewer than 25% of all Australian pupils stayed at school beyond the age of fifteen. Even today only one third of Australian school children complete secondary education. Universities were established in Sydney and Melbourne in 1850 and 1853. It was not until the mid seventies, when the number of Universities had increased to nineteen did participation in higher education exceed 10%. In recent years there has been a large increase in the enrollment of students over the age of 25 who now constitute 40% of the student population.

The Commonwealth Government has taken increasing responsibility for the financing of higher education, establishing in 1959 a Universities Commission. Non-advanced post school education known as technical and further education (TAFE) had always been a purely State activity. In 1975, following complaints from employers about the inadequate quality and quantity of technical education, the Commonwealth created a TAFE Commission and this sector has grown considerably.

In the decade since 1975 the number of students undertaking external studies courses has increased much more rapidly than total students. In universities the number of students doubled to over 16,000 in 1985 and in CAEs (Colleges of Advanced Education) it trebled to almost 29,000. Students enrolled externally now number some 45,000, or 12 per cent of total higher education students and about 8 per cent of total studentload. There are also over 55,000 external students in the TAFE system. The number of institutions offering courses in the external studies mode has grown from six before 1970 to 40; seven of these are universities and the remainder are advanced education institutions.

In 1977, in an effort to coordinate and check the expenditure on education (peaking at 6.3% of GNP), a Commonwealth Tertiary Education Commission was created with subordinate councils for Universities, Colleges and TAFE. As a result of this increased spending in a time of recession modifications were made to plans for the extension of numbers and resources for students were reduced. This had a marked negative influence on expenditure on educational technology resources.

2.2. NSW DEPARTMENT OF TAFE AND NEW TECHNOLOGIES

In Technical and Further Education there are 7,000 courses being delivered to 500,000 students - its methodologies not based on results of research but on the basis of 'maybe its a good idea'. They look forward to reading the results of the DELTA programme and there may be a potential market there for European educational products.

As part of a national TAFE External Studies Network Scheme, agreement has been reached to published all new course material in either hard copy or digital form and to make the digital stored material available either on floppy discs, or by direct transmission through Telecom Services to compatible terminals anywhere in Australia. In addition, consortium and bureau arrangements for the development, production and tutoring of selected courses by inter-state co-operation are in hand.

They are working on the prototype of an interactive videotape system which will be available for AU\$2800 - computer and player in one machine.

The main objective in designing delivery systems for continuing education and training to reach the individual at his or her place or work rather than at a central location.

The University of the South Pacific have been receiving distance education courses since the late sixties using firstly ATS 1 and in the last few years Intelsat. The University is funded by eleven nations and has its central administration on Fiji. Other campuses are spread widely over thousands of miles of the South Pacific and each country has distance education service centre.

The main delivery systems used are print and audio tape and the satellite is used as a tutorial tool to help students in difficulty by telephone conferencing (one person speaking at a time and speakers invited to talk by a chairperson).

2.3. TELECOMMUNICATIONS AND LEARNING

Radio is still used in Australia for schools broadcasts to remote areas e.g. School of the Air run by Golden West network in Central Australia. Facilities for educational satellite broadcasting were set up by the Federal government but subsequently sold to private enterprise. Sky channel is used occasionally for training purposes. SBS, Special Broadcasting Service is a station aimed at multicultural groups and funded by central Government. It carries one hour per day of educational broadcasting, mainly aimed at teachers. There is almost no educational broadcasting aimed at adults.

When the Australian government put up their satellite, 3-4 years ago education was used as an alibi but now it is actually used commercially. There is also a multicultural aspect to add: English is not the unique language; inside the Sydney area 20 languages are spoken.

Higher Education in Australia has been rationalised in the last 5 years and 8 distance education centres (DECs) have been specified by the Government. In New South Wales the centres are at New England. Some experimental broadcasting, both television and radio has been carried out at the University of New South Wales on an old UHF frequency allocation. The license for such broadcasting, which consisted of the play-back existing videotapes, has not been renewed.

A consortium from the University sector in New South Wales has proposed that a broadcast Educational Television Network be set up to promote continuing education and training. It

is suggested that associated with the Network would be Multi-State Agency (or Open College) to coordinate the courses for credit offered over the network.

The main purpose of the Channel would be to broadcast Educational programmes of all kinds together with a proportion of Community programming. There would be a core of course material for credit. Each consortium would be independent and operate its own television station but material would be shared and exchanged by a variety of means (including tape despatch, landline, microwave or satellite). The stations would be operated in a similar manner to Public Radio stations; by a mixture of professional staff, media students and community volunteers. Programme material would be obtained from many areas but where possible would be produced locally. The operational and production costs would be met from a variety of sources - including student fees, income from government and industry training bodies, federal education grants, commercial sponsorship and sales of tapes and other materials. The "Network" would be associated with a national agency for course accreditation. It would also utilise other media and technologies including print, radio, tele-conferencing and computer-based learning.

The first practical steps to attain this dream have been taken with the setting up of Uninet and fibre-optic network supplied by Telecom connecting the University of Technology, Sydney (UTS) University of New South Wales (UNSW) Macquarie University Television Service. The pilot phase of the project has been completed with the connection of the University of New South Wales and Sydney University into the Telecom network. Uninet was inspired directly by the example of London University's 'Livenet'.

Telecom is providing, free for charge to the universities two optical fibre networks to nominated single point on each campus, modulators and demodulators (codecs) to enable these fibres to carry high quality television and sound as well as 2 megabyte compressed video.

The aim of the project is

- To create a powerful information network between the four main university campuses in the Sydney region.
- To instrument the network to carry quality analogue television signal which can be remotely routed through a switch situated at a Telecom exchange (probably Sydney South).
- To instrument the system to enable 2Mbit per second data exchanges between universities.
- To enable and encourage universities to share television programmes and to support the development of educational broadcast television.
- To enable development, demonstration and use of interactive video conferencing between campuses in support of administration, teaching and research.
- To encourage wide-ranging research and experience of telecommunications in support of learning and administration in areas such as, but not at all limited to remote interactive videodisc databases, electronic mail, voice mail, remote access to computer aided design systems, remote access to "supercomputer" and other specialist computer resources.
- To encourage wide ranging research and development of systems and equipment to enable network operation to move to fully digital operation within several years.
- To provide convenient access for these universities to the broader Telecom network and, in particular, the 2Mbit per second digital service. This would enable these universities, at favourable rates, to create videoconference links to other parts of Australia and, through OTC, overseas.
- To provide Telecom with results of experience of operation of such a network and details of further developments as provided for in specific contracts between Telecom and the individual institutions.

9.4. SOME OTHER EXPERIMENTS IN NEW TECHNOLOGIES IN EDUCATION AND TRAINING

Trial of course-delivery by satellite: Two courses in Catering - 1 Bar services
- 2 Cellar operations.

Transmitted by Sky Channel on Aussat. An evaluative study in 1988 recommended that TAFE continue and expand satellite-based course delivery.

The Ministry of Education in Western Australia and Golden West Network enabled educational broadcasts to be transmitted live from Perth to the whole state and used telephone talkback techniques.

Australian Caption Centres' Supertext Superdisc Project, Surrey Hills NSW 'Ask the workers' - a videodisc demonstrating more than 250 different types of work and offering career advice to deaf, hearing impaired and normal Australian school children. Canberra College of Advanced Education.

GLOSSARY OF TERMS

AI	Artificial Intelligence, the science of mimicking human "intelligent" behaviour by a machine, ie. a computer.
AIM	Advanced Informatics in Medicine in Europe
AL	Action Line - refers to the 5 areas of DELTA research actions.
ALT	Advanced Learning Technology
Authoring	Writing or creation of learning material.
Authoring environment	The set of tools, facilities and systems that enables a author to design and/or produce computer based learning material
Audit	An independent assessment of a project.
B-ISDN	Broadband digital integrated services digital network.
C	A common high order computer programming language popular with courseware authors.
CAD/CAM	Computer-aided design/manufacture.
CAI	Computer Assisted Instruction.
CAL	Computer Assisted Learning.
CaTV	Cable Television.
CBT	Computer Based Training.
CCITT	Comité Consultatif International Télégraphique et Téléphonique.
CD	Compact Disc
CD-A	Compact Disc Audio. One uniform, standardised format used around the world.
CD-I	Computer Disc - Interactive.
CD-V	Compact Disc Video
CEC	Commission of the European Communities.
CEPT	Conférence Européenne des Administrations des Postes et des Télécommunications. (The European Conference of Postal and Telecommunications Administrations.)
CIM	Computer-integrated manufacturing.

Glossary of Terms

CNET	Cen'tre National d'Etudes des Telecommunications.
COMETT	A programme of the Commission for the co-operation between universities and business / industry for advanced training in technology, being "COMMunity Programme in Education and Training for Technology".
COST	Concerted action in Science and Technology
Courseware	Learning material delivered by a computer
CPU	Central processing unit.
DB	Database.
DBMS	Database Management System.
DBS	Direct Broadcasting Satellites.
Decision Support System	Any computer based support of medical, managerial, administrative and financial decisions in health using knowledge bases and/or reference material.
Delivery	The action of getting the material, once produced, to the learner.
DELTA	Development of European Learning Through Technology Advance.
DELCO	DELTA Central Office, DGXIII-F, TREV00/1, CEC, 200 Rue de la Loi, B-1049 Brussels, Belgium. Telephone +32 2 236 34 16, FAX +32 2 236 23 92
DeMC	DELTA Management Committee, a committee of member state representatives established to guide the implementation of the DELTA programme.
Distance learning	A learning situation where the learner and the provider of learning material or the learning opportunity are not physically at the same location
Distributed authoring	The situation where different authors collaborate while not being physically at the same location
DGXIII	Directorate General in the Commission dealing with IT&T and Information Markets, full title is Telecommunication, Information Industries and Innovation.
DRIVE	Dedicated Road Infrastructure for Vehicle Safety in Europe
DVI	Digital Video Interface A digital video compression scheme set as an industrial standard only.
EADTU	European Association of Distance Teaching Universities

EFTA	European Free Trade Association. EFTA consists of Austria, Norway, Sweden, Finland and Switzerland. Note that Iceland in EFTA, but outside the scope of EFTA/EEC co-operation agreement frameworks and therefore is not on the definitive list.
ELTA	European Learning Technology Association.
EBIT	The European Broadband Interconnect Trial - an experimental switched 2M/Sec network being implemented by some European TAs.
EC	The European Community.
ECU	The European Currency Unit
E-Mail	Electronic Mail.
ESA	European Space Agency, operators of the OLYMPUS satellite.
ESPRIT	European Strategic Programme for R&D in Information Technology.
ETSI	The European Telecommunication Standards Institute.
EUREKA	European Research Co-ordination Agency. Programme with the objective to strengthen the European cooperation in high tech areas via standardising and infrastructural projects.
Eurocontact	This is a database system running at UCD to enable partner searching to be automated, to enable collaborative R&D contacts to develop faster.
Eurokom	This is an electronic mail and conferencing system running at UCD.
EUROTECNET	European Technologies Network. This is a programme concerning vocational training in the new technologies.
EURYDICE	Is a European Educational Information Network, based in Brussels. Information form The Director, EURYDICE, Rue Archimede 17, Boite 17, B1040 Brussels, Belgium. Telephone +32 2 230 03 98 or +32 2 230 03 82; FAX +32 2 230 65 62, telex 635981.
Expert Systems	A computer programme that uses knowledge to attain high levels of performance in a problem area. These programmes typically represent knowledge symbolically, examine and explain their reasoning processes, and address problem areas that require years of special training and education for humans to master.

Facsimile (FAX)	A service providing for the transmission and reproduction at a distance of still pictures, printed matter and similar documentary material.
FAX (=Telefax)	Facsimile (qv).
Framework Programme	The CEC have co-ordinated all science and technology research under one broad umbrella programme, formally called the Framework Programme. The first integrated framework programme commenced in 1987 and will terminate in late 1991. The OJ reference is OJ COM(86) 430 Final, Brussels, 05.08.1986. DELTA is included under AL II/3 on page 17 of this document. Copies may be obtained from CEC bookshops.
HDTV	High Definition Television
IBC	Integrated Broadband Communications Network.
IBCN	Integrated Broadband Communications Network.
ICVD	Interactive Compact Disc Video A new but isolated video storage standard, not compatible with those already in existence.
Interoperability	The ability for different equipment or software to interwork without special one off adaptation or modification.
IRM	Information Resource Management.
ISDN	Integrated Services Digital Network.
ISO	International Standards Organisation.
IT	Information Technology.
IT&T	Information Technology and Telecommunications. It is defined to include communication systems such as high and medium power direct broadcasting satellites, two-way interactive cable systems, low power broadcasting, computers including personal computers and portable systems; television including compact discs, video discs, and various forms of video and other data media such as digital paper.
IV	Interactive Video
KBS	Knowledge Based System, a type of intelligent program paradigm which can make context based inferential decisions and self modify its own behaviour, of which Expert Systems are one type.
Knowledge Acquisition	The process of extracting, structuring, and organising knowledge from some source, usually human experts, automatically or by interviewing, so it can be used in a programme.

Knowledge Based System	A computer system that uses knowledge and inference methods to solve problems.
Knowledge Representation	Some formal language for the description of knowledge.
LAN	Local-Area Network. A private packet-switched digital network interconnecting computers, PCs, or workstations - usually confined to one building or a closely associated group of buildings.
Learner model	Electronic representation of attributes, characteristics and knowledge of a Learning Technology This is defined as the application of advanced IT&T to the support of learning, teaching and training.
LISP	LISt Processing language, a common implementation language for AI and expert systems
LOGO	A computer language often used in learning systems.
LSRM	Learning Systems Research Model The conceptual framework around which DELTA actions occur, based on AL I.
LV	Laser Vision video Disc Uses format designed for compatibility with national TV standards, NTSC, PAL. Laser discs manufactured for a particular TV standard can be played back only on the appropriate laser disc player. There is a lack of standardisation with interface cards and overlay systems.
Machine Learning	A term from AI, meaning learning by a machine, which eventually becomes more "knowledgeable" and can adapt to more situations in the future than if the past because it has "learned".
MMI	Man-Machine Interface.
MSX	A Japanese attempt to standardise operating systems amongst smaller computers mainly used in the home games market.
Minitel	The French public videotex (viewdata) system.
Multimedia	Combination of different media, such as computer software, video and audio.
Natural Language	Refers to the use of "natural language" as a means of expression on computers.
Olympus	ESA satellite for extensive use by educational projects.
Open Learning	Learning in an unstructured situation, as opposed to the traditional classroom situation. It includes a wide variety of scenarios for learning in the home, office and manufacturing environment, as well as higher educational structures.

Glossary of Terms

OSI	Open Systems Interconnect. The OSI reference model defines a framework for the development of its standards. Often called the "7 layer model" because it includes 7 horizontal "layers" corresponding to 7 basic IT parts and the protocol by which these parts communicate with each other.
OS	Operating system - a computer language for every machine that permits programming and control of the components of the system, such as file handling systems, communications, I/O drivers, printers etc.
PACE(EUROPACE)	Programme of Advanced Continuing Education in Europe based on high quality short life material delivered by satellite. Run by a PACE secretariat. Information may be obtained from Mr. L Cerych, Executive Secretary of PACE, Université Paris-Dauphine, F-75116 Paris. Tel :(33) 1.47.04.75.68.
PCTE	Portable Common Tool Environment, based on the project P32 in ST in ESPRIT.
PETE	Portable Educational Tool Environment, a concept in DELTA to encourage the emergence of a common set of standards for the development of tool sets that can interwork.
Portability	The ability of some software developed on one system to work on another system. AHDA is a language specially designed to promote this feature.
Production Environment	In the DELTA context, it is the system that produces the Courseware ready for distribution and use.
Prototyping	Considering the development of Expert Systems, a prototype is the first version of an ES. It is developed in order to test the effectiveness of the knowledge representation and the inference structure that are used to solve a particular problem.
RACE	Research into Advanced Communications in Europe
R&D	Research and Development.
ROM	Read Only Memory.
Smart Cards	Small computer embedded in card the size of a credit card that can hold substantial amounts of information - e.g. an education record.
SME	Small and Medium size Enterprise
SPRINT	Strategic Programme for Innovation and Technology Transfer.
STAR	Special Telecommunications Actions in Regions.
Teletext	Textual and limited graphics information that can be displayed on a television screen - usually broadcast by a television company as a secondary service.

TEDIS	Trade Electronic Data Interchange Systems
Transputer	A new kind of computer chip - incorporating a processor, memory and communications facility of high capability on one chip. The nature of the inter-transputer communication make this system very modular and by replicating the number of transputer, the overall performance of a system can increase almost linearly. It has been developed by INMOS, of Bristol, UK.
Tutoring	Is the monitoring, helping and assessment of the learner.
TVRO	Television Receive-Only Antenna
UCD	University College Dublin, Ireland, site of Eurokom and Eurocontact.
U-Matic	A wide format video tape system for heavy professional use and replication.
UNIX	A common operating system, which is a registered trademark of Bell Laboratories.
UNIX V	A particular version of Unix favoured by many standardisation initiatives.
User interface	Programmes and devices, that are placed at the disposal of the computer's user.
UUCP	Unix to Unix Copy - a common means of exchanging files under Unix. There is a facility for Unix based E-mail at UCD under the ESPRIT programme.
Videotext	Except in the US is used synonymously with Viewdata (The US usage is as a generic term including teletext and viewdata systems.
VSAT	Very Small Aperture Terminal
WAN	Wide - area network A network providing long-distance interconnection of local-area networks (LANs) (qv).
Workstation	A general term for various types of keyboard and screen which differ in regard to their processing power, their screen resolution and their spectrum of capabilities. They may be low-cost devices, e.g. hand-held computers, or highly expensive equipment allowing for complex handling of data from e.g. multiple biosignal or imaging devices.
WORM	Write Once Read Many times

FULL TABLE OF CONTENTS

Annex - Overview of flexible and distant learning	1
1. Introduction	1
2. Flexible and distance learning in the European Community	2
2.1. European commission programmes on open and distance learning	3
2.2. Cross-national initiatives on open and distance learning	4
2.3. National initiatives in the European community	6
2.3.1. Education	6
2.3.2. Training	6
3. Flexible and distant initiatives in the Eastern Countries	10
4. Flexible and Distance initiatives in North America	12
4.1. Distance education	12
4.2. Training	13
4.3. Telecommunications and learning	15
4.3.1. Canada	15
4.3.2. The United States	16
4.4. Learning and information technology	18
5. Flexible and distant initiatives in Latin America	19
6. Flexible and Distance initiatives in Africa	20
7. Trends in Flexible and Distance Learning in Asia	21
8. Flexible and Distance Learning in Japan	25
8.1. Introduction	25
8.2. Distance education	26
8.3. Information Technology and education	27
8.4. Information Technology, Telecommunications and Training	27
9. Flexible and distance learning in Australia	29
9.1. Introduction	29
9.2. NSW Department of TAFE and New Technologies	30
9.3. Telecommunications and learning	30
9.4. Some other experiments in new technologies in Education and Training	32
Glossary of Terms	33